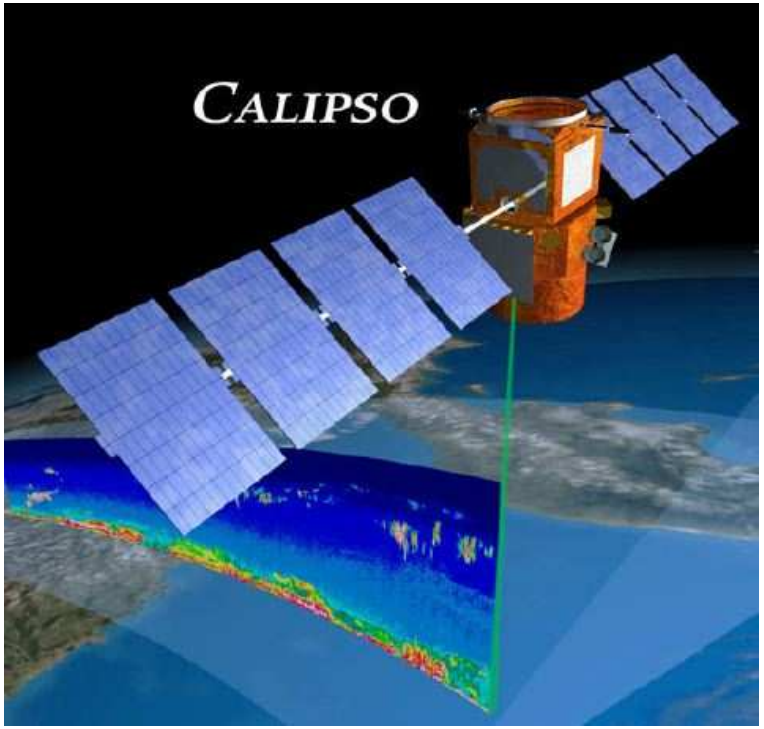
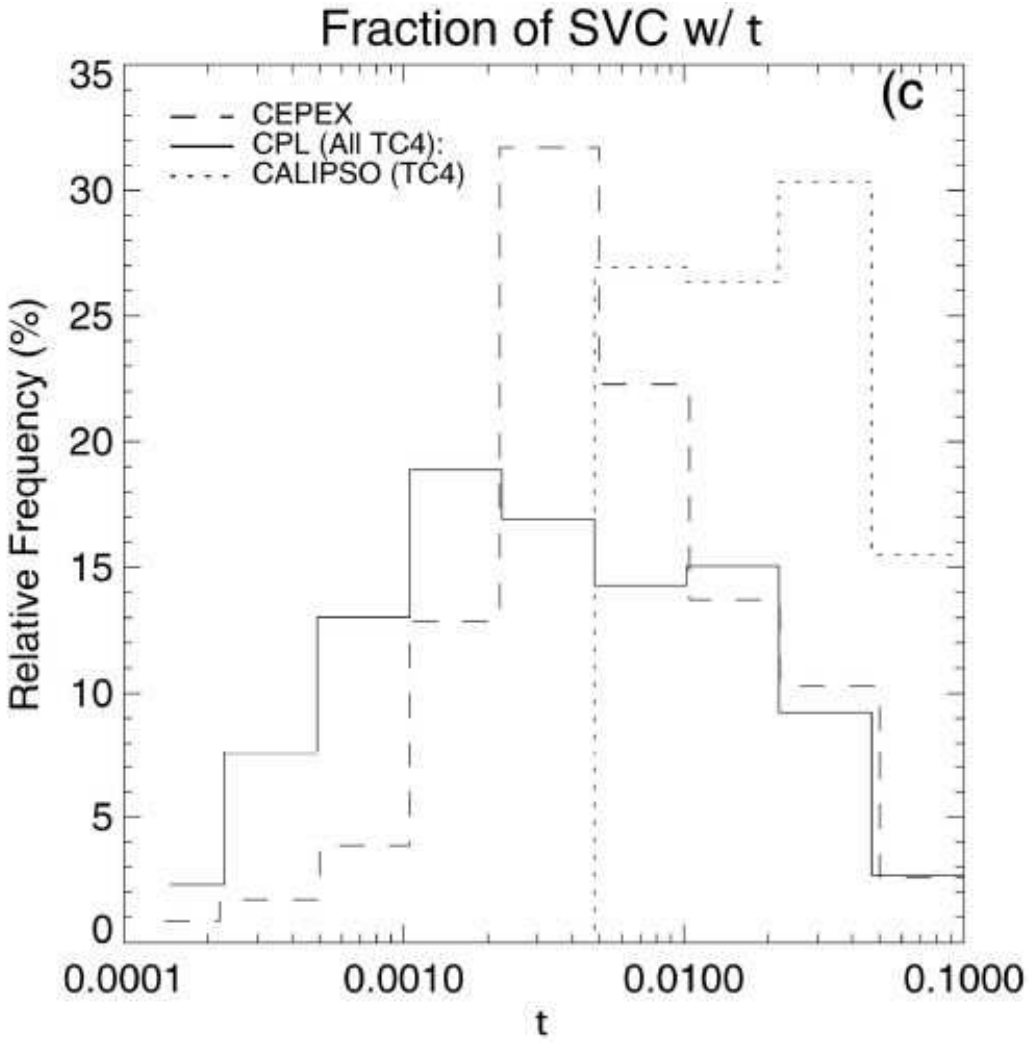
How do CPL measurements of TTL cirrus complement information from CALIPSO?



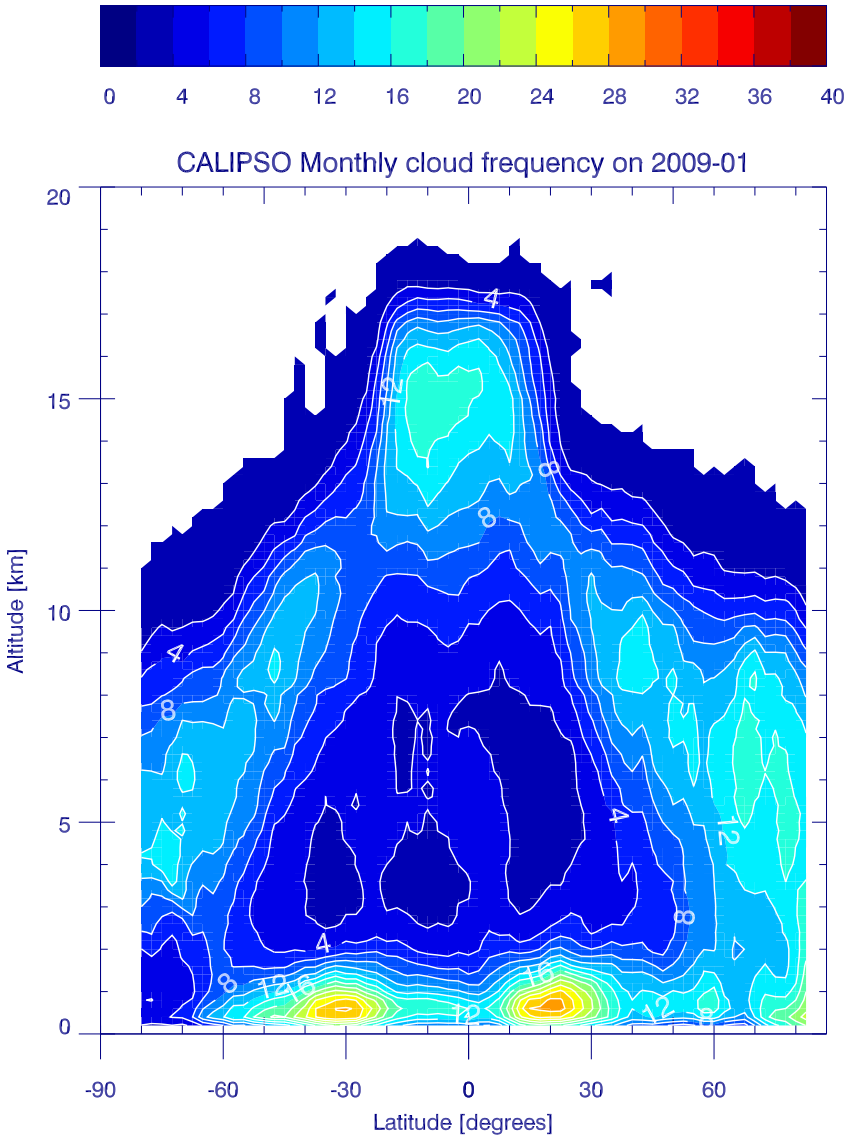
CPL provides:

- Better sensitivity: detection of optically thin TTL cirrus
- Better spatial resolution: small-scale structures in TTL cirrus

TTL cirrus optical depth frequency distribution [Davis et al., 2010]

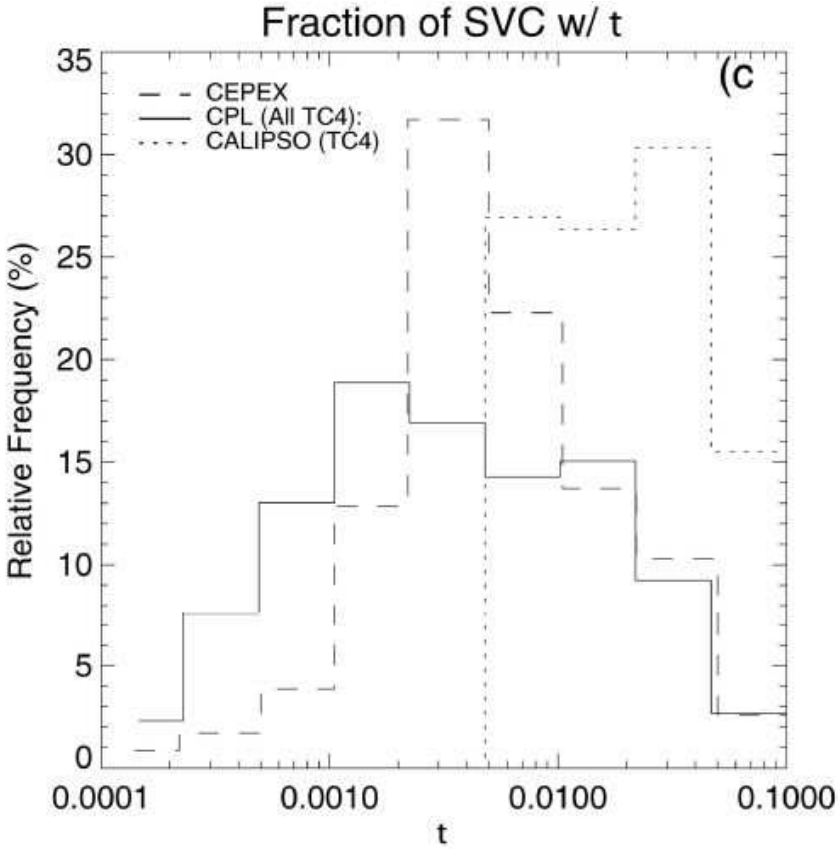


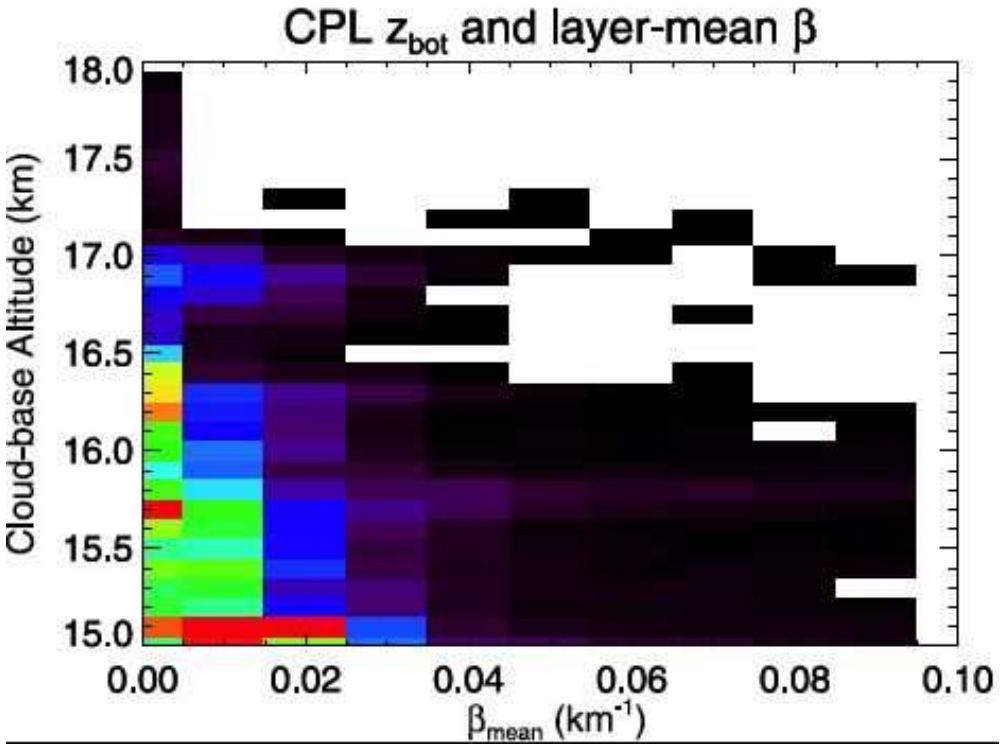
- CPL only detects about half of the subvisible cirrus detected by CALIPSO



- The frequency distribution of clouds detected by CALIPSO peaks about 2 km below the cold point.

TTL cirrus extinction versus height [Davis et al., 2010]



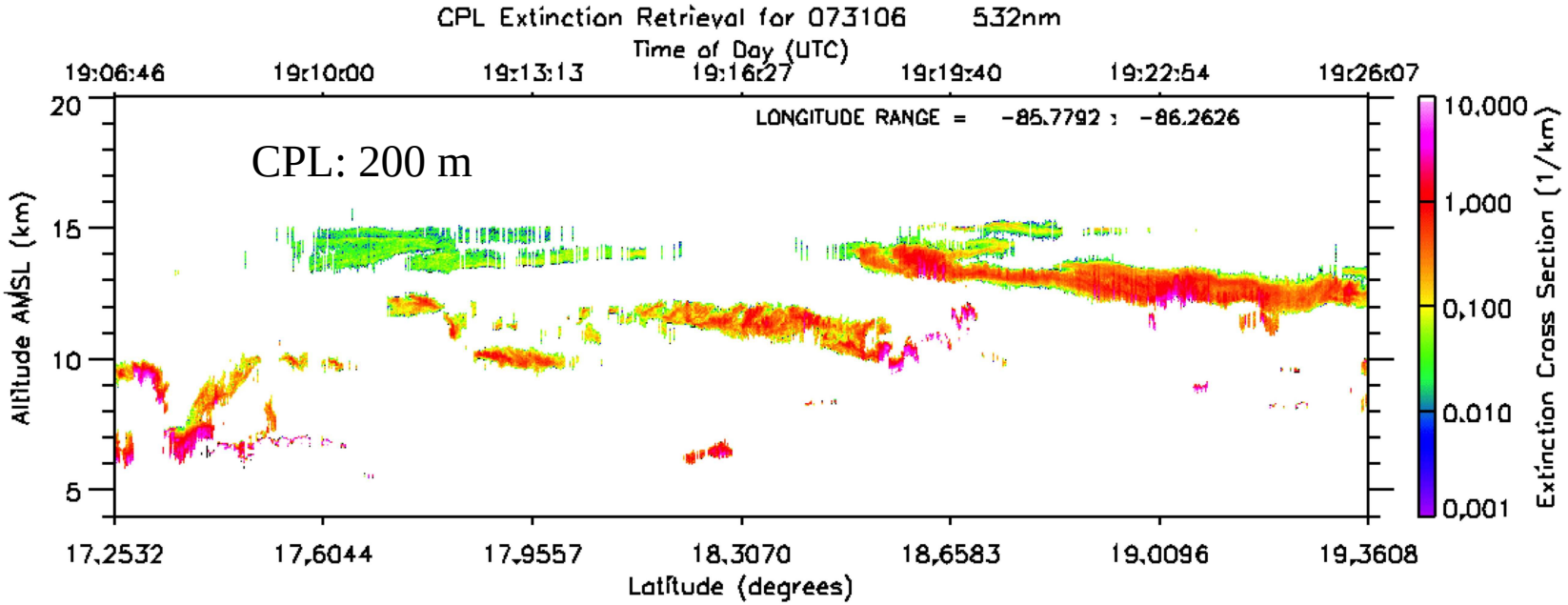


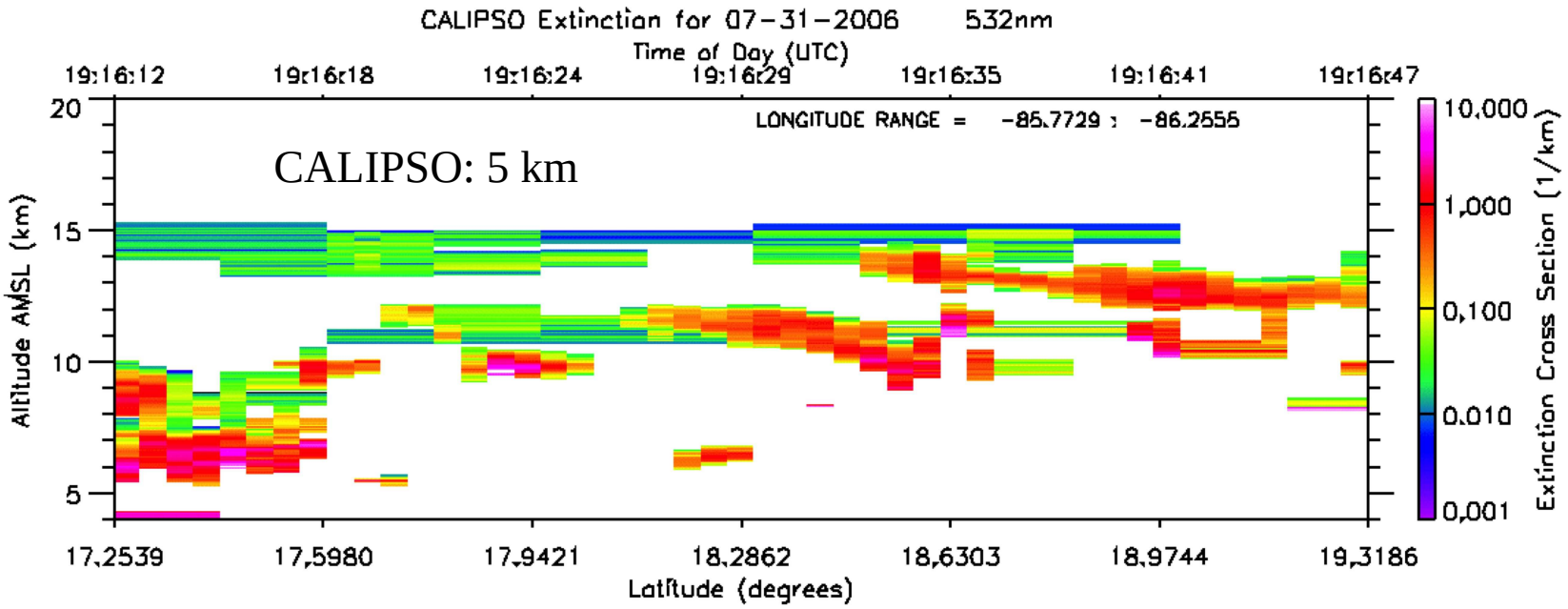
- Extinctions between about 15.8 km and cold point ($\simeq$17 km) typically have extinctions below CALIPSO's threshold.
- Clouds near cold point are most important for dehydration.

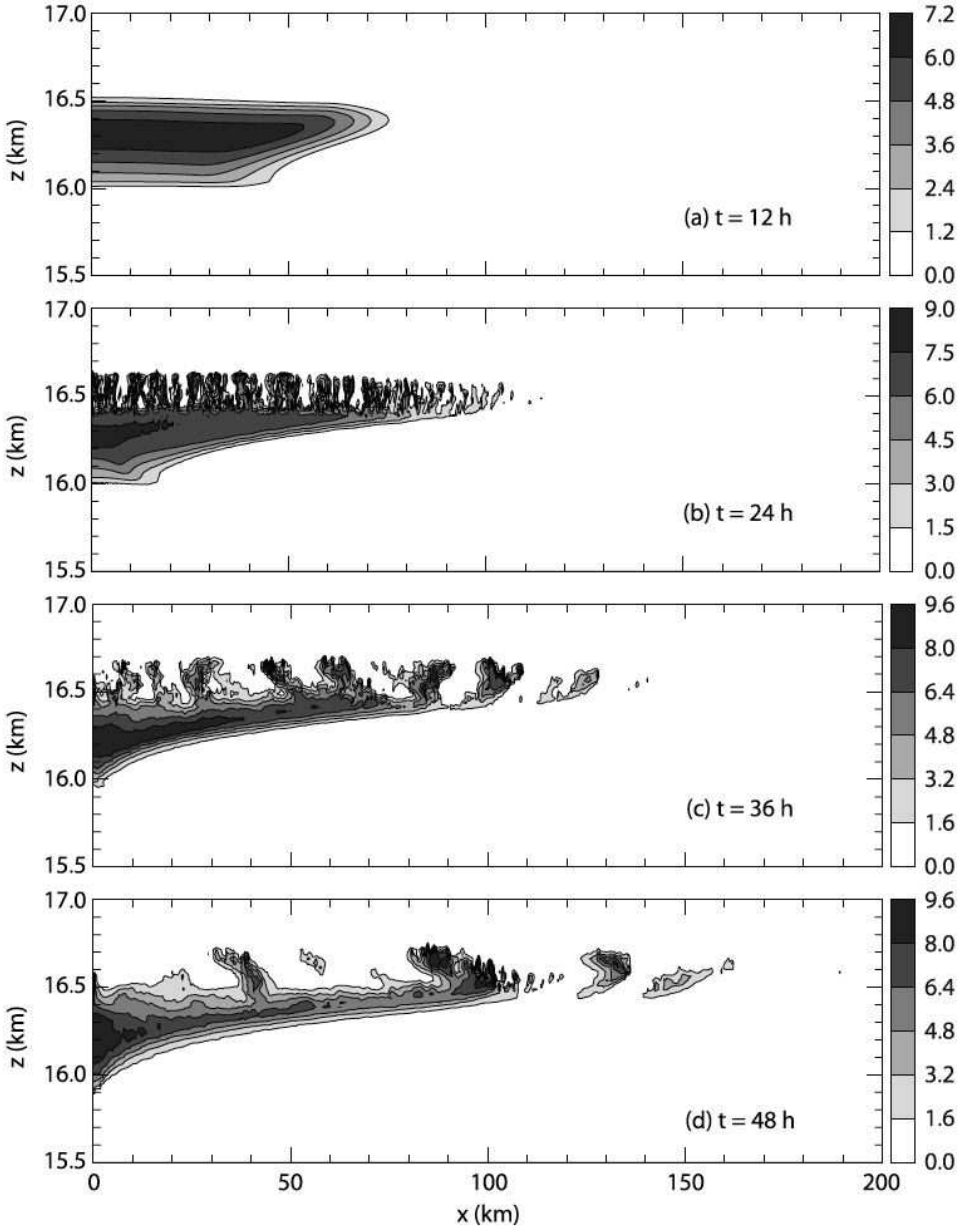
- Science question: do cirrus that are too tenuous for detection by CALIPSO occur frequently just below the tropical cold point?

- What ATTREX can provide:
  - Extensive CPL measurements with high sensitivity
  - Measurements of relative humidity structure in uppermost TTL

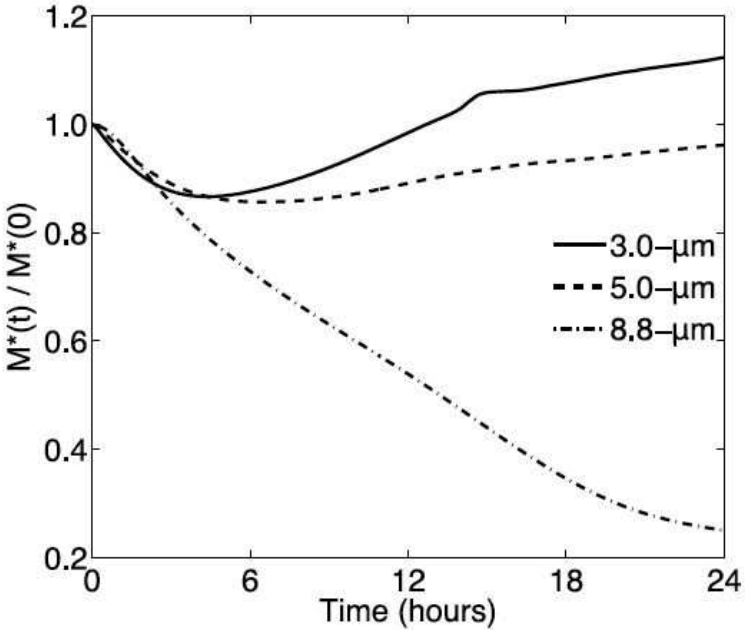
Resolution of small-scale horizontal structure







Dinh et al. [2009]



- Under some conditions, circulation driven by TTL cirrus radiative heating can maintain clouds
- Radiative heating drives small-scale convection (cell widths $\simeq$1 km)

- Factors determining the importance of radiatively-generated impacts on TTL cirrus lifecycle:
  - Ice crystal size
  - Thermal stabitlity
  - Wind shear
  - Presence of anvil cirrus below
  - Temperature variability

- What ATTREX can provide:
  - Extensive measurements of TTL cirrus structure for comparison with models
  - Additional measurements of TTL cirrus microphysical properties
  - Case studies for modeling